REMARKS

Claims 4 and 14 have been cancelled previously. Claim 20 has been cancelled. Claims 1-3, 5-13, and 15-19 remain pending. Claims 16, 18, and 19 have been currently amended.

Objections to the Drawings and Specification

The Office Action objects to Figures 1-3 for failure to indicate that they represent Prior Art. Applicants have corrected the drawings as suggested by the Office Action and attached the replacement sheets to this response.

The Office Action also noted the use of the trademark "Liquidmetal" in the application and requested it be capitalized and accompanied by the generic terminology wherever it appears. While Applicants recognize that "Liquidmetal" may be a trademark in certain areas of commerce, the application does not use the phrase "liquid metal" in this sense. Rather, the application refers to liquid metal generically, describing a metal in liquid form, such as mercury at room temperature. Because of the term's generic use, capitalization and other adjustments are not necessary.

Claim Rejections Under 35 U.S.C. § 112

The Office Action rejects claim 7 under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement by containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Specifically, the Office Action contends that the specification "does not state bearing being composed of ceramic needles, only ceramic balls."

Applicants have amended paragraph [0035] of the specification to illustrate how embodiments having a bearing with ceramic needles are comprehended by the invention, thereby making the specification compliant with 35 U.S.C. § 112. Support for this amendment can be found in, at least, claim 7 as filed in the original application. Applicants respectfully request that the rejection of claim 7 under § 112, first paragraph, be withdrawn.

Claim Rejections Under 35 U.S.C. § 102(a)

The Office Action rejects claims 1, 3, 5, 9-10, and 12-13 under 35 U.S.C. § 102(a) as being anticipated by U.S. Publication No. US 2005/0178662 ("Wurczinger '662"). Applicants respectfully traverse this rejection on the ground that Wurczinger '662 does not teach or suggest each and every limitation recited in these claims.

Claims 1, 3, 5, 9-10, and 12

Applicants submit that Wurczinger '662 does not teach "a power coupler" as recited in claim 1. In particular, independent claim 1 recites, among other things, "a power coupler . . . positioned between the bearing and the seal to thereby limit the current that flows through the bearing." The Office Action cites two distinctly different portions of Wurczinger '662 as support for Applicants' power coupler: figure 2, part 18 and p.1, para 17-18, but Applicants contend that Wurczinger '662 does not disclose "a power coupler . . . positioned between the bearing and the seal to thereby limit the current that flows through the bearing."

With respect to figure 2, part 18, Wurczinger '662 discloses a rotary drive unit **(18)** for rotating the tube cathode **(2)** (Wurczinger '662, p.1., para. 19). The element disclosed in this portion of Wurczinger '662 is not an electrical power coupler as disclosed in Applicants' invention, nor is the element in the same position as the power coupler in Applicants' invention.

First, the rotary drive unit **(18)** from Wurczinger '662 provides mechanical power to the tube cathode **(2)** rather than electrical power as is provided by Applicants' power coupler. Moreover, the rotary drive unit **(18)** from Wurczinger '662 is positioned outside the bearing arrangement **(17)** (Wurczinger '662, figure 2, part 18) and not "between the bearing and the seal" as claimed in Applicants' invention. As a consequence, the rotary drive unit **(18)** cannot support "a power coupler . . . positioned between the bearing and the seal to thereby limit the current that flows through the bearing" as required by claim 1.

In p.1, para 17-18 of Wurczinger '662, a voltage source **(9)** connected to a tube cathode **(2)** is disclosed. Here, Wurczinger '662 does not teach or suggest a power coupler positioned between a bearing and a seal nor does Wurzinger '662 disclose limiting the current that flows through the bearing. In fact, Fig. 2 of Wurczinger '662 teaches attaching a voltage source **(9)** to a current feed **(23)** in contact with a bearing arrangement **(16)**. Rather than an arrangement with "a power coupler ... positioned between the bearing and the seal to thereby limit the current that flows through the bearing", the configuration in Wurczinger '662 shows the current feed in contact with a bearing arrangement, thereby maximizing the current that flows through the bearing arrangement. As a result, p.1, para 17-18 does not support "a power coupler . . . positioned between the bearing and the seal to thereby limit the current that flows through the bearing" as required by claim 1.

Because Wurczinger '662 neither teaches nor suggests the claim 1 limitation of positioning a power coupler "between the bearing and the seal to thereby limit the current that flows through the bearing," Applicants believe claim 1 is allowable. In addition, since claims 3, 5, 9-10, and 12 depend from claim 1, Applicants consider these claims to be allowable at least by

virtue of their depending from an allowable base claim. Applicants respectfully request the rejection of claims 1, 3, 5, 9-10, and 12 under § 102(a) be withdrawn.

Claim 10

Claim 10 stands rejected as being anticipated by U.S. Publication No. US 2005/0178662 ("Wurczinger '662"). In addition to claim 10 being allowable by virtue of its dependence on allowable independent claim 1, Applicants submit that claim 10 should not be rejected because Wurczinger '662 does not teach or suggest each and every limitation from this claim.

Applicants submit that claim 10 is allowable because Wurczinger '662 does not teach or suggest "the power coupler comprises a water-cooled slip ring connector" as required in claim 10. The Office Action presumably cites to figure 3, part 4 of Wurczinger '662 as support for the "water-cooled slip ring connector" from claim 10. But figure 3, part 4 of Wurczinger does not teach or suggest "a water-cooled slip ring connector" nor does the Office Action show how figure 3, part 4 of Wurczinger '662 even relates to a power coupler as required in claim 10. Although the Office Action references voltage source **(9)** and current feed **(23)** from Wurczinger '662, there is no explanation in the Office Action as to how part 4 relates to parts 9 and 23, nor does Wurczinger '662 provide any such discussion.

Part 4 of Wurczinger '662 is an "inlet **4**" (Wurczinger '662 p.2, para 21) or a cooling means supply **(4)** (Wurczinger '662, p.2, claim 7) for a rotatable tube cathode. This is not the same as "a water-cooled slip ring connector" as described in Applicants' invention (Applicants' Figure 14). As a consequence, Applicants submit claim 10 may not be properly rejected under Wurczinger '662 and requests that the § 102(a) rejection be withdrawn.

Claim 13

Similarly to independent claim 1, independent claim 13 recites, among other things, "the power coupler is positioned between the bearing and the seal." As explained above, Wurczinger '662 neither teaches nor suggests positioning a power coupler between a bearing and a seal. Rather, Wurczinger '662 shows connecting a voltage source to a current feed located, not between bearing arrangement and sealing ring, but in contact with the bearing arrangement on the outside of the bearing arrangement (i.e., on the surface of the bearing arrangement furthest from the rotational axis) (Wurczinger '662, Fig. 2). Because Wurczinger '662 neither teaches nor suggests positioning a power coupler between the bearing and the seal, Applicants respectfully request the rejection of claim 13 under § 102(a) be withdrawn.

Claim Rejections Under 35 U.S.C. § 102(b)

The Office Action rejects claim 19 under 35 U.S.C. § 102(b) as being anticipated by Japanese Patent No. 01305523 ("Toki '523"). Applicants respectfully traverse this rejection on the ground that Toki '523 does not teach or suggest each and every limitation recited in this claim. Claim 19, as currently amended, recites:

A system for coating a substrate, the system comprising:

a rotatable target;

a bearing configured to rotatably engage the rotatable target;

and a liquid-metal electrical connector configured to deliver power to the rotatable target, wherein the liquid-metal electrical connector is positioned between the bearing and the rotatable target to limit the current that flows through the bearing.

Support for this amendment can be found in, at least, original claim 20. As amended, claim 19 teaches positioning a liquid-metal electrical connector between a bearing and a rotatable target to limit the current that flows through the bearing. This is not taught or suggested by Toki '523. Rather, as shown in the abstract, Toki '523 teaches a bearing case **(2)** which contains a bearing **(3)** and is "filled with electrically conductive liquid" (Toki '523, abstract ¶ 1). As shown in the abstract, the "electrically conductive liquid" in Toki '523 surrounds the bearing **(3)**. This arrangement integrates a connection terminal and bearing in a manner which would put the bearing in the path of the current instead of "limit[ing] the current that flows through the bearing" as required by Applicants' claim 19.

The Office Action mentions that the resistivity of mercury will "automatically limit the current at a certain point." This argument, however, is not relevant because is would not be the placement of the electrical connector which would limit current flow, but its composition. Even so, the low resistivity of mercury is higher than that of other metals, including steel (which has a resistivity of 1.18×10^{-7} Ωm, less than 1/8 that of mercury). Therefore, if a steel bearing is submerged in mercury in the manner Toki '523 teaches, the current through the bearing would be higher than at other places in the connector because the conductive path through the steel would be less resistive. Because Toki '523 does not teach each and every limitation of claim 19, as currently amended, Applicants submit that claim 19 may not be properly rejected under Toki '523 and respectfully requests claim 19 be favorably reconsidered.

Claim Rejections Under 35 U.S.C. § 103(a)

The Office Action rejects claims 2, 6-8, 11, and 15-20 under 35 U.S.C. § 103(a) as being obvious in view of how it applied the Wurczinger '662 reference to claims 1 or 13, and in further

view of certain other references. Applicants respectfully traverse these rejections on the ground that the combined references do not teach all of the limitations recited in the claims.

Claims 2, 6-8, 11, and 15

The Office Action relies on its assertion that claims 1 and 13 are anticipated by Wurczinger '662 to support rejecting dependent claims 2, 6-8, 11, and 15 under § 103(a). However, as discussed above, Wurczinger '662 does not teach or suggest each and every limitation recited in claims 1 and 13. Because Wurczinger '662 does not teach this limitation by itself or in combination with other references used by the Office Action, Applicants respectfully request the rejection of claims 2, 6-8, 11, and 15 under § 103(a) be withdrawn by virtue of their dependence from a valid base claim.

Further objections to the rejection of claims 6 and 7 are discussed below.

Claim 6

The Office Action rejects claim 6 under § 103(a) as being obvious given how it applied Wurczinger '662 to claim 1, and in further view of U.S. Patent No. 6,736,948 ("Barrett '948"). Because claim 6 is dependent on claim 1, claim 6 is allowable by virtue of its dependence on a valid claim. In addition, because the combination of Wurczinger '662 and Barrett '948 will not work, there is no motivation to combine the references upon which the Office Action relies.

The Office Action states that "[i]t would have been obvious to one of ordinary skill in the art to compose the bearings of ceramic material taught in Barrett '948 for the bearings in Wurczinger '662 in order to gain the advantages of imperviousness to heat due to electrical conduction from current flow . . . ." This combination, however, does not work because Wurczinger '662 uses the bearing arrangement as a conductor by placing it in the path of the

current. Using ceramic bearing as taught by Barrett '948, on the other hand, ensures the bearing *does not* conduct electricity (Barrett '948, Col. 8 lines 33-35). Therefore, the Barrett '948 and Wurczinger '662 references fail to provide motivation to combine them in a manner that could read on claim 6 because the resulting combination would simply not work. Applicants respectfully request the rejection of claim 6 under § 103(a) be withdrawn.

Claim 7

The Office Action rejects claim 7 under § 103(a) as being obvious given how it applied Wurczinger '662 to claim 1, and in further view of U.S. Patent No. 4,115,283 ("Needham '283). Because claim 7 is dependant on claim 1, claim 7 is allowable by virtue of its dependence on a valid claim. Furthermore, Needham '283 does not apply because it does not teach needle bearings, which use needles as rollers in a manner analogous to how ball bearings use balls. Instead, Needham '283 discusses a material, consisting partially of ceramic or other fibers, which may be used in bearings and other applications requiring self-lubrication. Moreover, as discussed in relation to claim 6, above, even if Needham '283 did disclose ceramic needles, a ceramic material cannot be used with the bearing arrangement in Wurczinger '662 because the resulting combination would not work.

As a consequence, Applicants respectfully submit that Needham '283 does not teach or suggest "the bearing comprises ceramic needles" as recited in claim 7, and respectfully requests the rejection under § 103(a) be withdrawn.

Claims 16-18

The Office Action rejects claim 16 under § 103(a) as being unpatentable over Wurczinger '662 in further view of Toki '523. Claim 16 as currently amended clarifies distinctions over these references. The last portion of claim 16 now reads:

> a liquid-metal electrical connector positioned between the bearing and the rotatable tube and engaged with the shaft, the liquid-metal electrical connector configured to deliver power to the rotatable tube.

Support for this amendment can be found in, at least, Applicants' specification p.2, para [0037]. Without admitting it as true, even if, as the Office Action contends, it would be obvious to one of ordinary skill in the art to use the mercury connector taught in Toki '523 as the current feeds in Wurczinger '662, the combination of references still do not teach or suggest positioning the liquid-metal electrical connector between the bearing and the rotatable tube, as amended claim 16 requires. Because neither Wurczinger '662 nor Toki '523 teach positioning a power coupler between the bearing and rotatable shaft, as recited in currently amended claim 16, Applicants submit that claim 16 may not be properly rejected under Wurczinger '662 and/or Toki '523 and respectfully requests claim 16 be favorably reconsidered.

In addition, because claims 17 and 18 depend from claim 16, Applicants consider these claims to be allowable at least by virtue of their depending from an allowable base claim.

Claim 19

The Office Action rejects claim 19 under § 103(a) as being unpatentable over Wurczinger '662 in further view of Toki '523, but it failed to discuss the reasoning behind this rejection. As discussed above, Toki '523 does not anticipate these claims. Applicants further believe the addition of Wurczinger '662 does not teach or suggest the limitations Toki '523 fails to cover. Therefore Applicants respectfully request the rejection of claim 19 under § 103(a) be withdrawn.

CONCLUSION

In view of the foregoing, Applicants respectfully submit that no further impediments exist to the allowance of this application and, therefore, solicits an indication of allowability. However, the Examiner is requested to call the undersigned if any questions or comments arise.

The Director is hereby authorized to charge any appropriate fees under 37 C.F.R. §§1.16, 1.17, and 1.21 that may be required by this paper, and to credit any overpayment, to Deposit Account No. 50-1283.

Dated: 09/26/07

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